

PATENT SPECIFICATION

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(54) FILTER TUBE SECURING MEANS

(71) We, FILTERITE CORPORATION a Company of the State of Maryland of Timonium, Maryland, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us and the method by which it is to be performed to be particularly described in and by the following statement:—

This invention relates to tubular fluid filters of the type in which one or more tubular filter units are positioned within a casing and are sealingly attached to a partition, or header wall dividing the casing into two compartments with an intake pipe leading into the casing on one side of the header wall and outlet pipe leading from the casing on the other side of the header wall and passage of fluid from intake side to outlet side of the casing taking place through the filter units. More particularly this invention relates to a filter of the general tubular type described in which the tubular filter units have a central opening and are readily attachable and detachable from the header wall and therefore the invention is particularly concerned with the fastening means for sealingly attaching the filter units to the header wall.

According to the invention, there is provided a device for releasably securing a tubular filter unit to one side of a plate such that one end of the filter unit covers an aperture in the plate, which device comprises a holding and sealing element for engaging the other end of the filter unit; an elongated, resiliently contractible assembly adapted to extend through the interior of the filter unit, said assembly being secured at one end to the holding and sealing element and including at its other end an engagement portion adapted to pass through the aperture in the plate so as to detachably engage directly or indirectly the other side of the plate; and catch means whereby the assembly can be retained in an extended position so that the engagement portion can be disengaged from the said other side of the plate thereby releasing the filter unit.

[Price 25p]

Preferably the assembly comprises a first elongated member having one end secured to the holding and sealing element and slidably engaging the first elongated member and connected thereto by resilient means which urges the two elongated members into contracted relation, said second member being connected to the engagement portion of the assembly.

The invention also provides a filter assembly comprising one or more tubular filter units releasably secured to an apertured header plate by means of a device or devices as defined above.

In another aspect, the invention provides a method for releasably securing a tubular filter unit to one side of an apertured plate which comprises inserting a device as defined above into the interior of the unit so that the elongated assembly extends through the unit and the engagement portion passes through an aperture in the plate and engages the other side of the plate thereby urging one end of the unit into sealing engagement with said one side of the apertured plate, the other end of the unit being sealingly engaged by the holding and sealing element of the device.

The invention will now be particularly described with reference to the accompanying drawings, in which:

Figure 1 is a sectional view of a filtering device in which the present invention is incorporated;

Figure 2 is a perspective view of one filter unit with the filter element shown in phantom to more clearly illustrate the fastening means for the unit, the latter being shown in filter tube holding position;

Figure 3 is a view similar to Figure 2 with the fastening means in release position;

Figure 4 is a view similar to Figure 3 with the fastening means disengaged from the header ferrule and the unit ready for removal;

Figure 5 is a view of a modified form of filter tube securing means in position for attaching or detaching the filter tube;

Figure 6 is a similar view of the modified

fied form in an intermediate stage in the operation of attaching a filter tube in place; and

5 Figure 7 is a view of the modified form with the securing means in filter tube holding position.

Referring to the drawing in more detail, and particularly to Figure 1 thereof, 10 represents a casing, which may be of any cross-sectional shape, provided with an inlet pipe 11 and an outlet pipe 12. The casing is provided with a removable closure 13 at one end which is held in place by a conventional clamping means 14 and 15.

15 A partition or header wall 16 divides the casing into two compartments or chambers 17 and 18, the chamber 17 being the larger and containing one or more filter units generally designated 19 which will be hereinafter described in more detail.

20 The intake pipe 11 communicates with the filter chamber 17 containing the filter units and is provided with a baffle or diversion member 20 within the casing to more evenly distribute the fluid to be filtered throughout the chamber 17 and around the filter units.

25 The partition or header plate is provided with a number of openings 21 corresponding to the number of filter units to be accommodated within the casing and each opening is fitted with a ferrule 22 sealingly fixed in the header opening and extending on both sides of the header or partition plate and forming, in effect, a flange around each opening on one side of the plate. In an alternative embodiment flanges may be formed on each side of the plate around each opening.

30 To effect the sealing engagement of each ferrule 22 in the header plate opening, the ferrule may conveniently be press fitted into the opening, although any other means of fixing the same may be employed. For convenience, to insure uniformity of fitting each ferrule in its opening, the ferrule may be provided with a flange 23 which forms a stop for abutment against the header plate as the ferrule is inserted.

35 The ferrule 22 is further provided with an enlarged portion having an annular flange 22' concentric with the ferrule proper but of larger diameter to engage the end of a filter unit and form a seal therewith.

40 Referring now more particularly to Figures 2, 3 and 4 of the drawings, it may be seen that each filter unit 19 is in the form of a hollow tube 24 of filtering material. Various filtering materials which may be employed are well known, such as spirally wound yarn, so called filter papers, fabrics etc. but the specific materials employed are not important to this invention, as it is more concerned with the means of sealingly attaching the tubular filter unit to the header plate.

45 One form of attaching or holding means comprises a rod 25 having a hook 26 at one

end thereof and a tubular element 27 telescoped over the rod at its end remote from the hook 26.

A spring 28 under tension is telescoped over the rod 25 and has its hooked ends 29 and 30 attached to the rod through an opening 31 in the rod and through an opening 32 in the tubular element respectively and normally holds the rod telescoped well within the tubular element.

70 The tubular element is provided with a longitudinal slot 33 with a lateral branch 34 in its side wall, somewhat of the nature of a bayonet slot, while the rod 25 is provided with a pin 35 slidable in the slot 33 and branch 34.

75 The free end of the tubular element 27 is equipped with an enlarged head sealing member 36 having a flange 37 concentric with and spaced outwardly from the tubular element to sealingly engage the opposite end 24' of the filter unit to seal the opening therethrough.

80 The rod element 25 and the tubular telescoping element 27 are adapted to extend through the opening within a filter unit for holding the sealing member 36 and the flange 37 in contact with the end of the filter tube opposite the header. The sealing member 36 and the flange portion 37 constitute a single unitary sealing unit. This sealing unit is fixedly sealed axially to the end of the tubular element 27 opposite the header in any convenient manner such as welding, brazing, soldering, etc. This construction eliminates the necessity of packing, gaskets, washers, etc. being used to seal this outer sealing member about the tubular element which is necessary in the present type tube holding means, wherein the sealing means positioned over the end of the filter tube opposite the header is slidable along the supporting element. The means for extending the holding means 25 and 27 for removing the filter etc. will be referred to more fully hereinafter.

85 A handle, or bail 38 may be attached to the head member 36 to assist in manipulating the fastening means when attaching the filter unit in place as hereinafter described.

90 To attach a filter unit to the header plate or wall the rod 25 is pulled outwardly of the tubular element 27 until the pin 35 is opposite the lateral branch 34 of the slot 33 and rod 25 is then turned to locate pin 35 in branch 34, thus holding the spring stretched and the rod 25 and tubular element 27 in extended relationship to each other. The rod 25 and tubular element 27 are then passed through the filter unit and the latter positioned against the ferrule flange 22' with the hook 26 extended through and beyond the ferrule as shown in Figure 4. The hook is then manipulated to engage over the edge of the ferrule as shown in Figure 3 whereupon a slight pull on the bail handle 38 and a turn to the left will allow the pin 35 120 125 130

to enter the longitudinal slot 33 permitting the spring 28 to pull the rod 25 into the tubular element 27 thereby causing the flanges 22' and 37 to forcibly engage the opposite ends of the filter unit and hold the same in place on the ferrule 22.

The forcible engagement of the flanges 22' and 37 with the ends of the filter unit will be sufficient to form a seal between the flanges and the unit and no additional seals such as separate gaskets are necessary.

To detach a filter unit the above outlined steps are reversed.

It should be noted that the steps required for attaching and detaching a filter unit may be accomplished entirely from the end remote from the header, an important feature, especially in filters with many closely spaced units at it is evident that any attaching means would require handling or manipulation close to the header plate would present difficulties in such a congested space.

Referring now to the modified form of attaching means for a filter unit as shown in Figures 5, 6 and 7, there is provided an outer channel member 40 and an inner channel member 41 slidably telescoping with the outer channel member. The outer channel member has side flanges 42 to retain the inner channel within the outer and allow for sliding movement of the two channel members with respect to each other.

A rotary pawl member 43 is mounted on the web portion 44 of the outer channel member by means of a rivet or other equivalent fastening means 45 which permits free rotary movement of the pawl.

The pawl 43 is of generally rectangular form with the opposite ends thereof notched at 46 and 47 to provide V-shaped teeth 48 and 49 on each side of the longitudinal central axis of the pawl. These teeth, as can be seen, are not symmetrical at tooth 49 has a longer side surface 50 than the side surface 51 of tooth 48. The surfaces 50 and 51 of the V-shaped teeth are adapted to have engagement with abutment means provided therefor on the inner channel member 41.

One such abutment on the inner channel member may be formed by a struck up tongue or lug 52 located on the web portion of the channel while other abutments are formed by the end edges 53 and 54 of an opening 55 through one of the flanges on the inner channel member.

The outer channel member is also provided with an opening 56 but its purpose is merely to allow clearance for rotation of the pawl in the different positions it must assume in its function.

The inner channel member 41 is rigidly attached to the head member 46 with its flange 37 and handle 38 exactly duplicating corresponding parts in the first form above described, while the outer channel member

40 is attached to a rod 25 with hook 26, these parts duplicating corresponding parts in the first modification.

A tension spring 57 is stretched between the inner channel member 41 and the rod 25 and normally urges the two channel members to fully telescoped position.

The operation of the device shown in Figures 5, 6 and 7 is as follows.

Starting, for convenience, from the position shown in Figure 7, in which the telescoping channels are in fully retracted position and holding a filter tube in position against the ferrule flange 22' and upward pull on the handle 38 will cause the inner channel member to move upwardly within the outer channel member until lug 52 engages surface 50 of prong 49 of the pawl, at which point opening 55 in the inner channel will be opposite the pawl and opening 56 of the outer channel member. The cam action of lug 52 against the inclined surface 50 will cause the pawl to rotate until side surface 51 of prong 48 contacts the side of lug 52. At this position of rotation of the pawl the opposite prong 49 will project through openings 55 and 56 in the side flanges of both channels. If the pull on the handle 38 is then released the prong 49 projecting through the openings in side flanges of the inner and outer channel members will engage the end surface 54 of the opening in the inner channel while the adjacent prong 48 will engage the inner surface of the side flange of the inner channel adjacent the opening therein as shown in Figure 5 and the two telescoping channels will be held in extended position. The hook 26 may then be released and the filter unit removed. By again pulling upwardly on the handle 38, with the hook 26 engaged with the ferrule 22, the lug 52 will engage the side surface of the pawl as shown in Figure 6 and rotate the same to a position where release of the pull on handle 38 will allow the end surface 54 to contact the side surface of the pawl and allow the members to return to the initial position shown in Figure 7. Thus it may be seen that successive pulls and releases on handle 38 are all that is required to operate the fastening means and change from filter locking to filter releasing position.

It will be noted in this construction that there is no need for a slip packing joint between the outer sealing member and the holding means through which unclean fluid circulating through the filter may seep by the packing joint into the side of the filter carrying the clean filter fluid.

WHAT WE CLAIM IS:—

1. A device for releasably securing a tubular filter unit to one side of a plate such that one end of the filter unit covers an aperture in the plate, which device comprises a holding and sealing element for engaging the

other end of the filter unit; an elongated, resiliently contractible assembly adapted to extend through the interior of the filter unit, said assembly being secured at one end to the holding and sealing element and including at its other end an engagement portion adapted to pass through the aperture in the plate so as to detachably engage directly or indirectly the plate; and catch means whereby the assembly can be retained in an extended position so that the engagement portion can be disengaged from the said plate thereby releasing the filter unit.

2. A device according to claim 1, wherein the engagement portion comprises a hook.

3. A device according to claim 1 or 2 wherein the assembly comprises a first elongated member having one end secured to the holding and sealing element and a second elongated member slidably engaging the first elongated member and connected thereto by resilient means which urges the two elongated members into contracted relation, said second member being connected to the engagement portion of the assembly.

4. A device according to claim 3 wherein the resilient means comprises a tension spring.

5. A device according to claim 3 or 4 wherein one of the elongated members has a slot extending along part of its length and the other elongated member has a pin which engages the slot, and the said slot has a lateral branch whereby the first and second elongated members can be retained in the extended position against the action of the resilient means by rotating the said members relative to each other.

6. A device according to claim 3 or 4, wherein one of the elongated members has a rotary pawl and the other elongated member has a first abutment positioned so as to contact the pawl on extension of the elongated members thereby to rotate the pawl to

a position wherein the pawl will engage a second abutment on said other member to hold the members in the extended position, and wherein the first abutment will again engage the pawl and rotate the same to a release position upon a subsequent outward extension of the members to permit the members to telescope to a contracted position.

7. A device according to claim 1, substantially as hereinbefore described with reference to and as illustrated in Figs. 1 to 4 or Figs. 1 and 5 to 7.

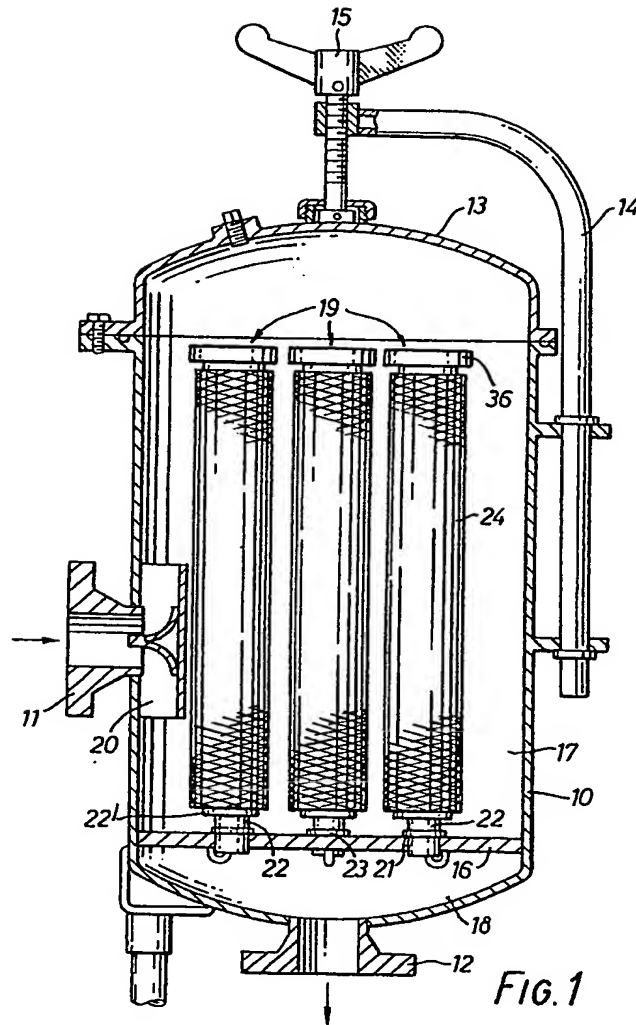
8. A filter assembly comprising one or more tubular filter units releasably secured to an apertured header plate by means of a device or devices according to any preceding claim.

9. A filter assembly according to claim 8, in which the or each aperture is provided with a ferrule against which one end of the or each filter unit is urged by the or each device.

10. A filter assembly substantially as hereinbefore described with reference to and as illustrated in Fig. 1 of the accompanying drawings.

11. A method for releasably securing a tubular filter unit to one side of an apertured plate which comprises inserting a device according to any of claims 1 to 7 into the interior of the unit so that the elongated assembly extends through the unit and the engagement portion passes through an aperture in the plate and engages the other side of the plate thereby urging one end of the unit into sealing engagement with said one side of the apertured plate, and the other end of the unit being sealingly engaged by the holding and sealing element of the device.

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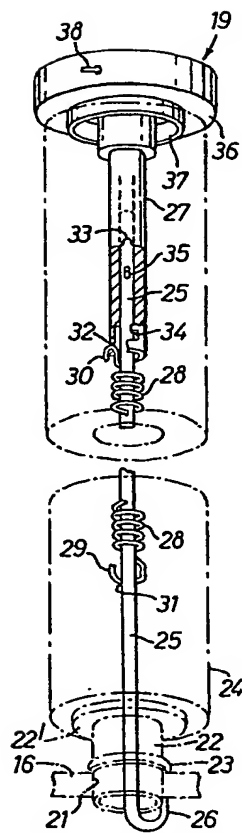


FIG. 2

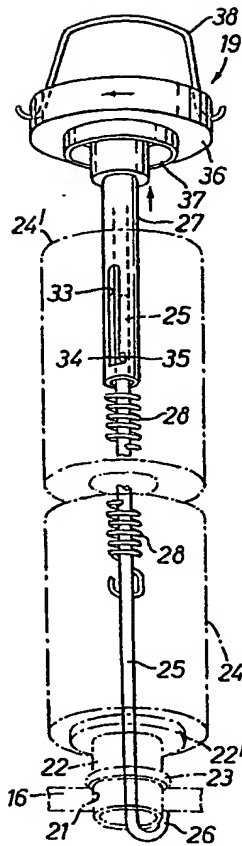


FIG. 3

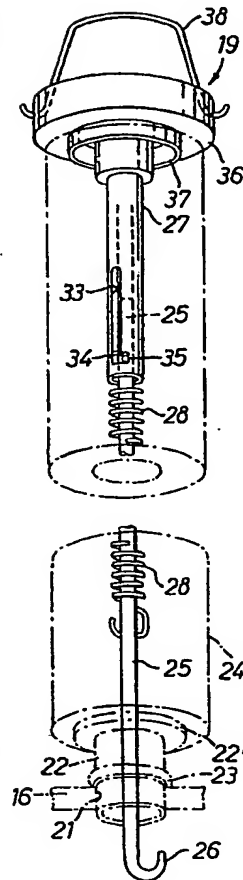


FIG. 4

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COMPLETE SPECIFICATION

3 SHEETS

This drawing is a reproduction of
the Original on a reduced scale
Sheet 3

